

CLAIMS

1. An exposure apparatus having an illumination system which applies an exposure energy beam to a mask having a pattern, and a stage system for positioning a substrate to which said pattern of said mask is transferred, characterized in that:

a gas supply apparatus for supplying a gas of a high transmittivity with respect to said exposure energy beam, and having good thermal conductivity, to at least a portion of an optical path of said exposure energy beam, and

a gas recovery apparatus for recovering at least a portion of said gas after said gas is supplied to the optical path of said exposure energy beam from said gas supply apparatus, are provided.

2. An exposure apparatus in accordance with claim 1, wherein said gas is helium.

3. An exposure apparatus in accordance with claim 1, wherein said gas supply apparatus is commonly employed by a plurality of exposure apparatuses.

4. An exposure apparatus in accordance with claim 1, wherein said gas recovered by said gas recovery apparatus is recirculated to the optical path of said exposure energy beam via at least a portion of said gas supply apparatus.

5. An exposure apparatus in accordance with claim 4, wherein said gas supply apparatus comprises:

a concentration meter for measuring the concentration of said gas supplied from said gas recovery apparatus,

a gas source filled with said gas in a gaseous state or a liquefied state, and

a control unit for replenishing gas supplied from said gas recovery apparatus with gas from said gas source in accordance with measurement results of said concentration meter.

6. An exposure apparatus in accordance with claim 1, wherein said gas supply apparatus comprises:

a gas source for conducting liquefied storage or high-pressure storage of said gas,

a conversion apparatus for returning the liquefied gas or high-pressure gas within said gas source to said gas, and

an adjusting apparatus for adjusting temperature and pressure of said gas prior to supplying said gas from said gas source to said exposure apparatus.

7. An exposure apparatus in accordance with claim 1, wherein said gas recovery apparatus liquefies said recovered gas or highly pressurizes it and stores it.

8. An apparatus for manufacturing devices characterized in having a plurality of exposure apparatuses including the exposure apparatus of claim 1, and in overlaying and

transferring a plurality of device patterns onto a substrate which is exposed and manufacturing microdevices.

9. An exposure apparatus which illuminates a mask with a predetermined exposure energy beam and transfers a pattern formed in said mask onto a substrate, characterized in that:

a gas-controlled drive apparatus is provided which conducts predetermined operations using a first gas for control,

a second gas having good transmittivity is supplied to at least a portion of the optical path of said exposure energy beam, and

a gas of the same type as said second gas is employed as said first gas for said gas-controlled drive apparatus.

10. An exposure apparatus in accordance with claim 9, wherein said gas-controlled drive apparatus comprises a stage apparatus which makes contact with guide surfaces by the gas bearing method, a gas-type cylinder apparatus, or a vibration isolation platform using gas as a portion of the shock absorbing material.

11. An exposure apparatus in accordance with claim 9, wherein, when said exposure energy beam is ultraviolet light having a wavelength of 250 nm or less, nitrogen or helium is used as said second gas.

12. An exposure apparatus in accordance with claim 9, wherein, when said exposure energy beam is ultraviolet light having a wavelength of 200 nm or less, helium is used as said second gas.

13. An exposure apparatus in accordance with claim 9, wherein, when said exposure energy beam is an X ray, nitrogen or helium is used as said second gas.

14. An exposure apparatus comprising:

an illumination optical system, having a plurality of optical elements supported by supporting members, which applies illumination light from an illumination light source to a mask having a pattern, and

a projection optical system, having a plurality of optical elements supported by supporting members, which projects an image of a pattern on said mask onto a photosensitive substrate, characterized in that:

all said optical elements are supported by said supporting members using push-attachment mechanisms without the use of adhesive.

15. An exposure apparatus in accordance with claim 14, wherein said push-attachment mechanisms comprise flat springs having one end thereof affixed to an inner circumferential part of said support members, and at another end, press against an outer circumferential part of said optical elements.

16. An exposure apparatus in accordance with claim 14, wherein said push-attachment mechanisms comprise screw rings which screwably attach to a screw part provided in an inner circumferential part of said support members and which are screwably advanced and press against an outer circumferential part of said optical elements.

17. An exposure apparatus comprising:

an illumination optical system, having a plurality of optical elements including a fly-eye lens bundling a plurality of rod lenses, which applies illumination light from an illumination light source to a mask, and

a projection optical system, having a plurality of optical elements supported by supporting members, which projects an image of a pattern on said mask onto a photosensitive substrate, characterized in that:

said plurality of rod lenses are bundled by a support apparatus without the use of adhesive.

18. A manufacturing method for apparatuses wherein an exposure energy beam is applied to a mask and a substrate is exposed by said exposure energy beam via said mask, comprising:

a supply pipe for supplying a gas for reducing attenuation of said exposure energy beam is connected to a gas chamber which seals, in an essentially airtight manner, at least a portion of the optical path of said exposure energy beam; and

a recovery pipe for recovering at least a portion of the gas supplied to said gas chamber is connected to at least one of said gas chamber and a housing in which said gas chamber is disposed.

19. A manufacturing method for exposure apparatuses in accordance with claim 18, comprising said recovery pipe is connected to a removal apparatus for removing impurities from recovered gas, and said removal apparatus and said supply pipe are connected.

20. A manufacturing method for exposure apparatuses in accordance with claim 18 further comprising optical elements which said exposure energy beam passes are affixed to supporting members without using adhesive, and are assembled into said exposure apparatus.

21. A manufacturing method for exposure apparatuses in accordance with claim 18 further comprising a gas-controlled drive apparatus which is provided in said exposure apparatus and which employs a gas having optical characteristics which are essentially identical to those of said gas is connected with said gas supply source.